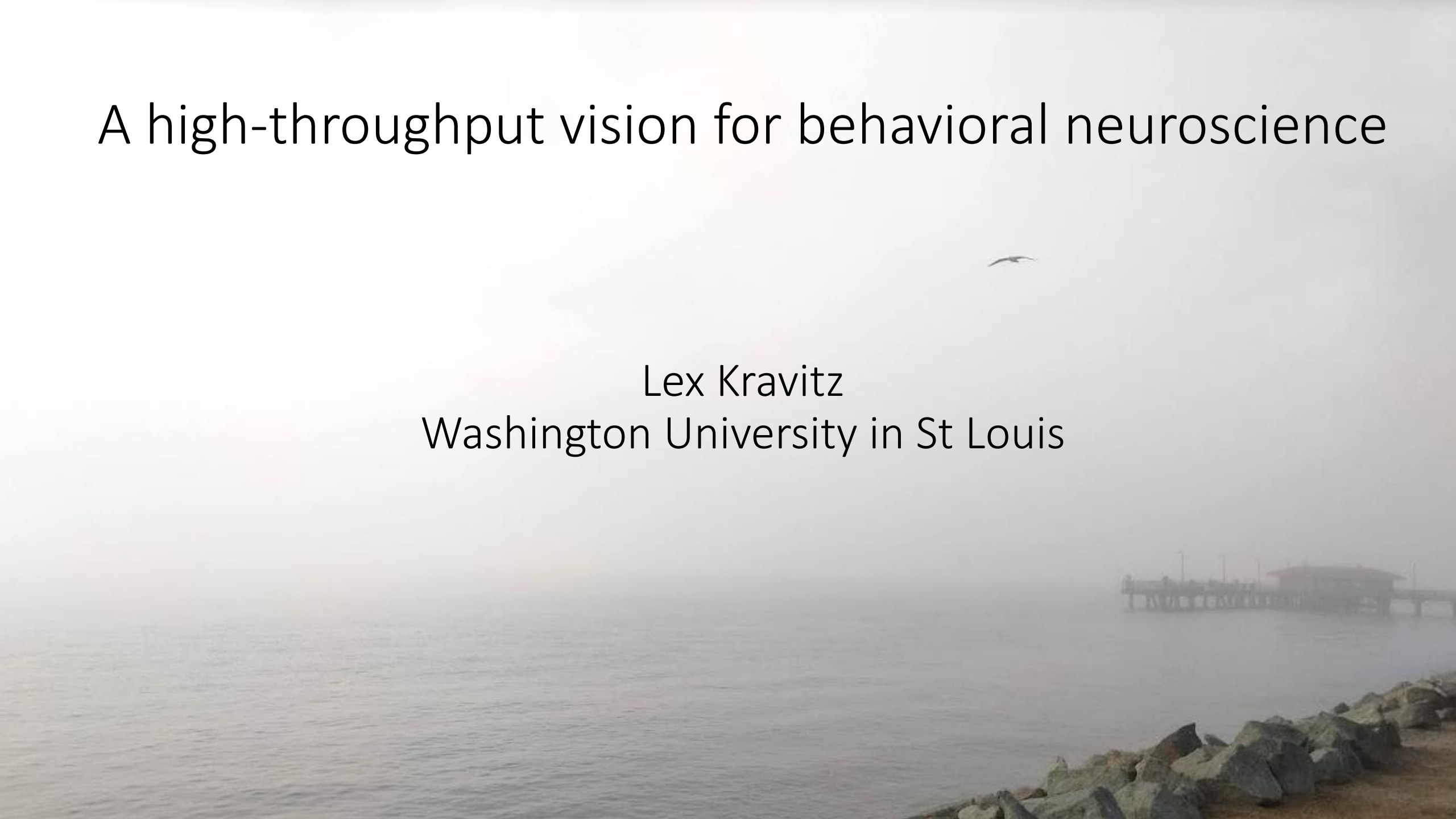
A high-throughput vision for behavioral neuroscience

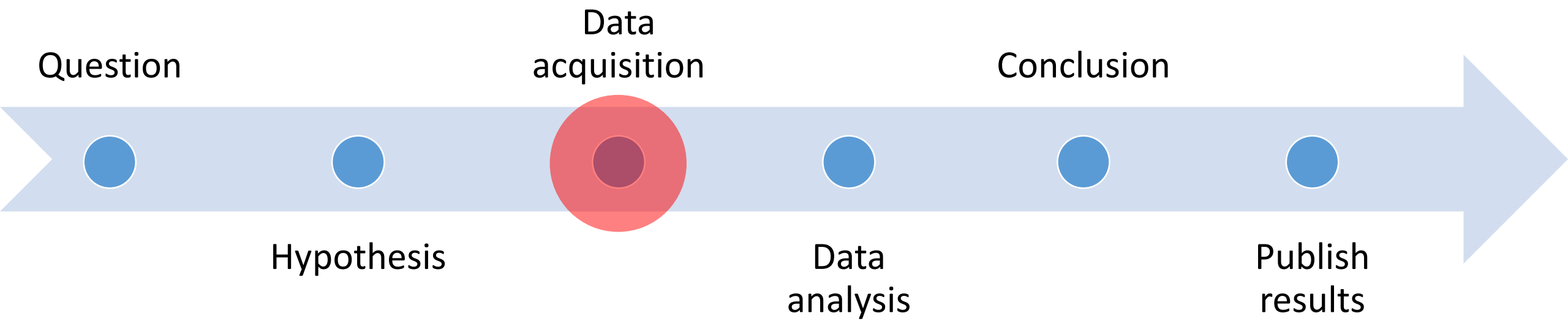
Lex Kravitz
Washington University in St Louis



I have no conflicts of interest

This talk is available at:
http://www.kravitzlab.com/talks/

The idealized scientific process



nature International weekly journal of science

ANALYSIS

Power failure: why small sample size undermines the reliability of neuroscience

Katherine S. Button[1,2], John P. A. Ioannidis[3], Claire Mokrysz[1], Brian A. Nosek[4], Jonathan Flint[5], Emma S. J. Robinson[6] and Marcus R. Munafò[1]

Abstract | A study with low statistical power has a reduced chance of detecting a true effect, but it is less well appreciated that low power also reduces the likelihood that a statistically significant result reflects a true effect. Here, we show that the average statistical power of studies in the neurosciences is very low. The consequences of this include overestimates of effect size and low reproducibility of results. There are also ethical dimensions to this problem, as unreliable research is inefficient and wasteful. Improving reproducibility in neuroscience is a key priority and requires attention to well-established but often ignored methodological principles.

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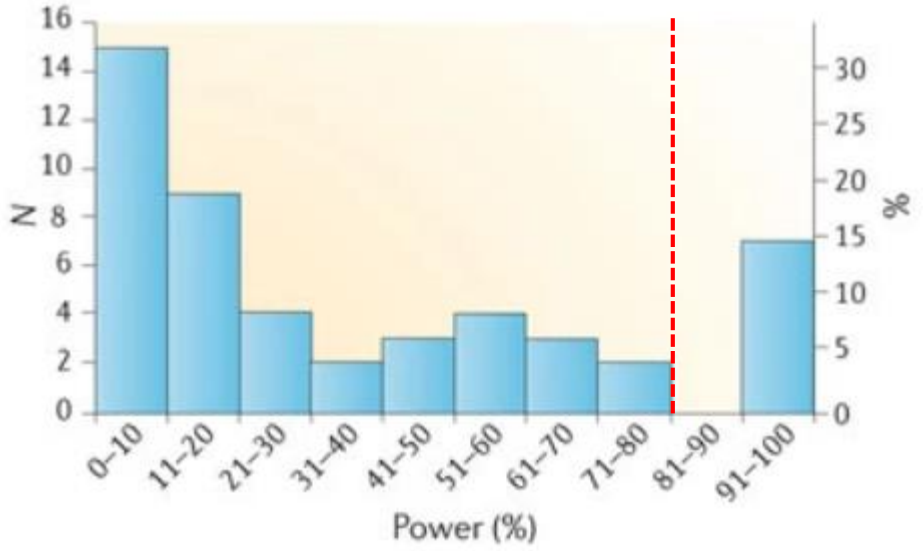
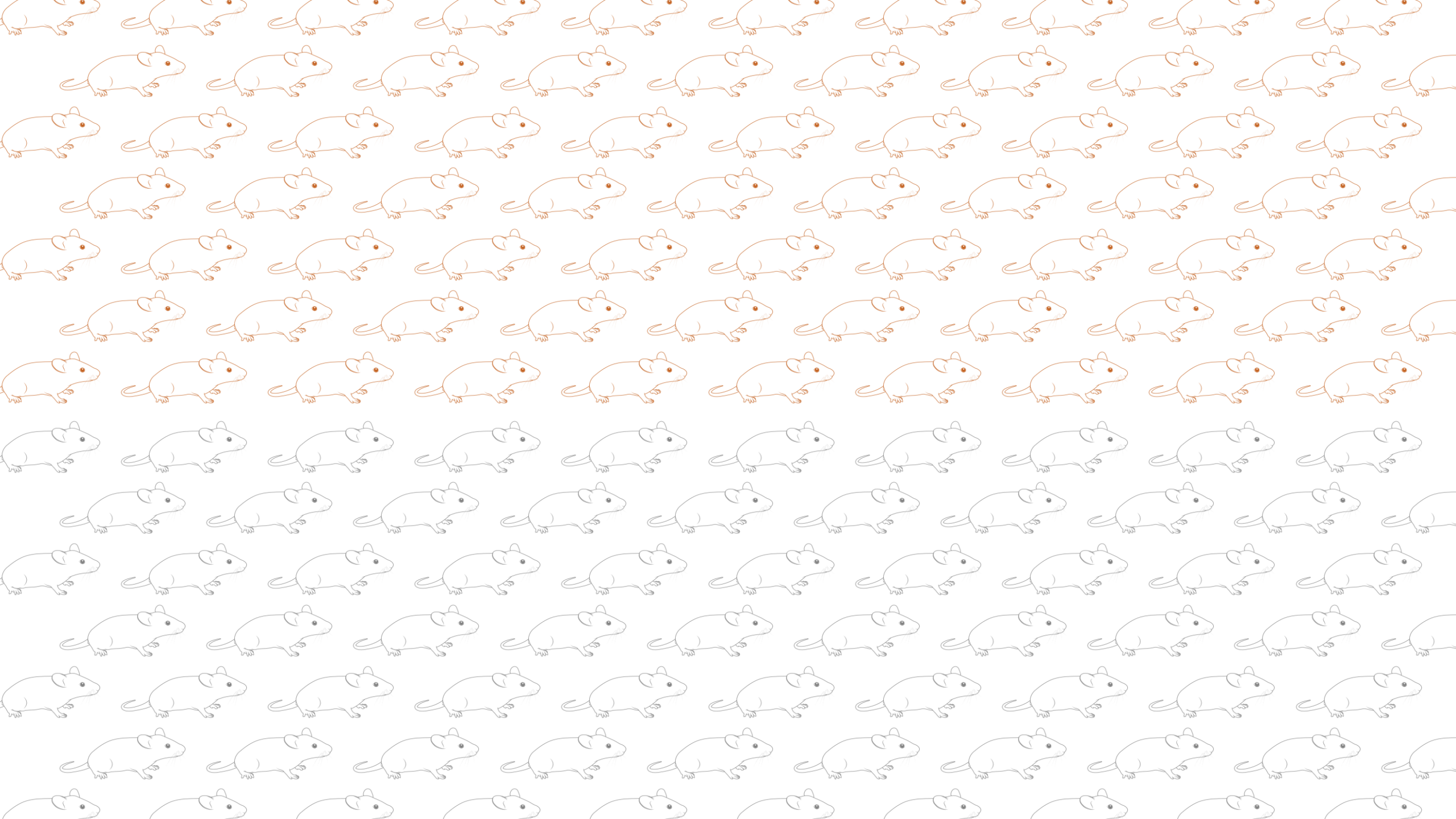
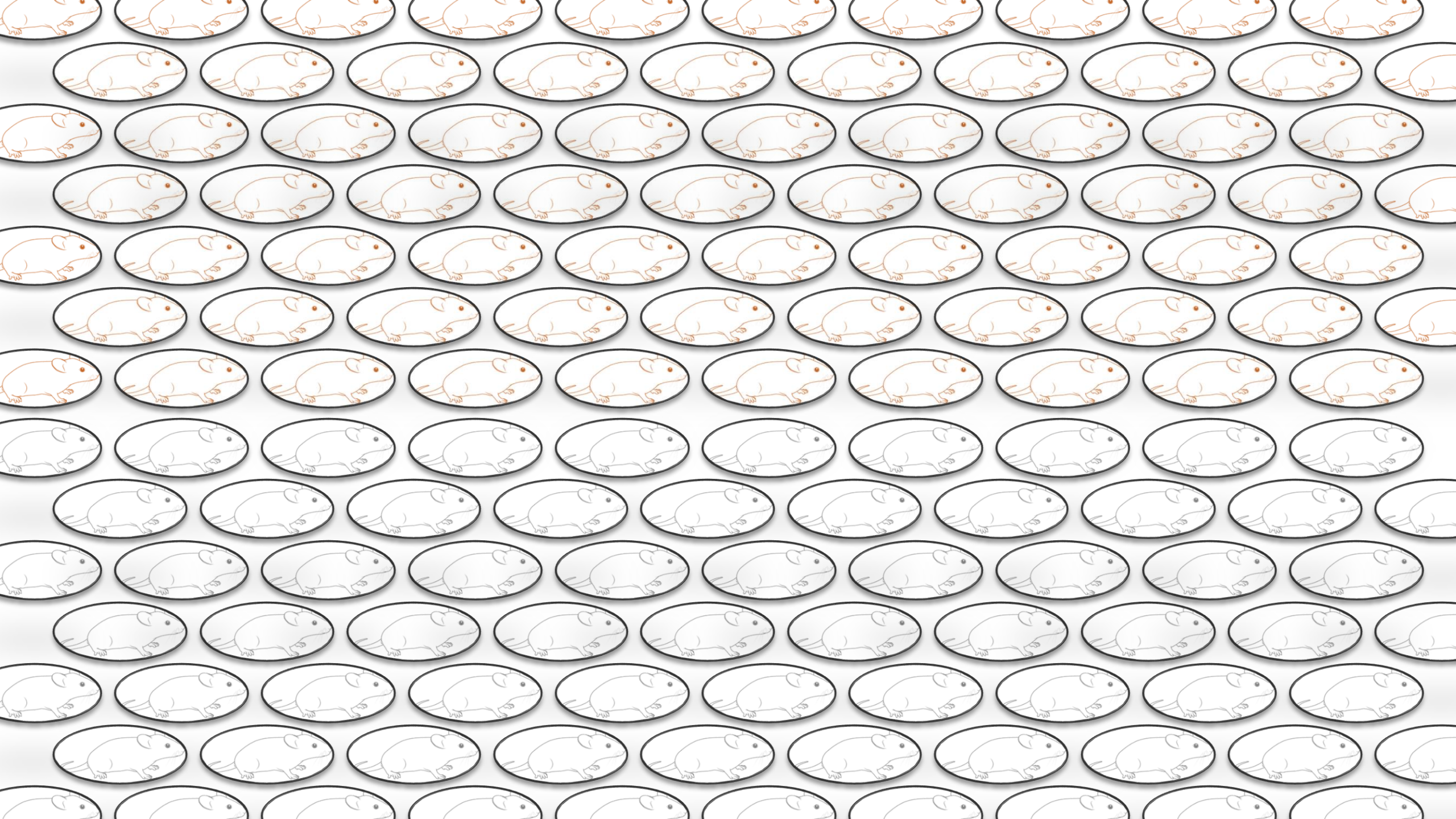
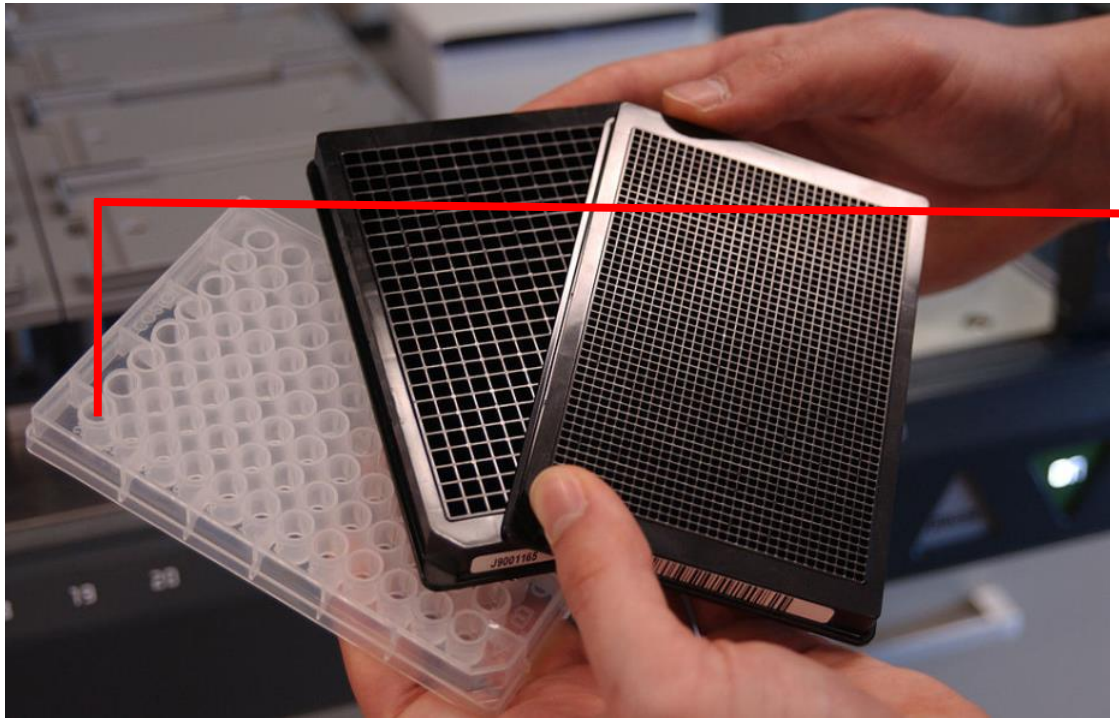


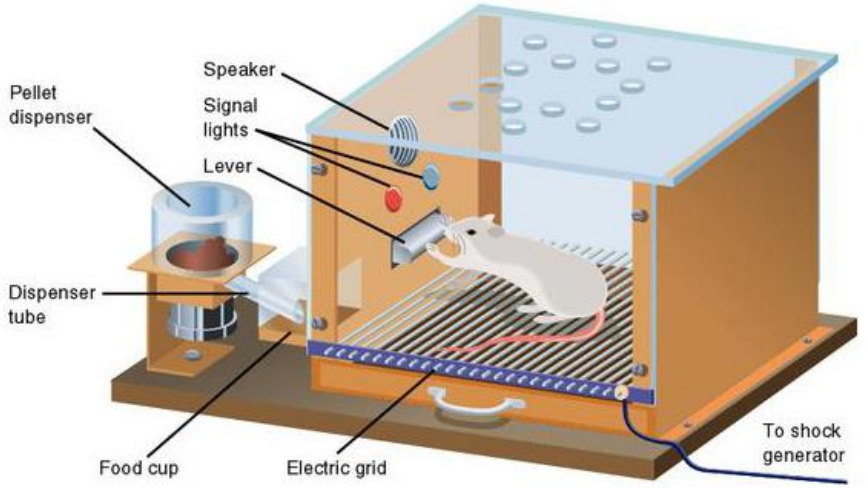




How have other scientific fields solved the power problem?



You are here!



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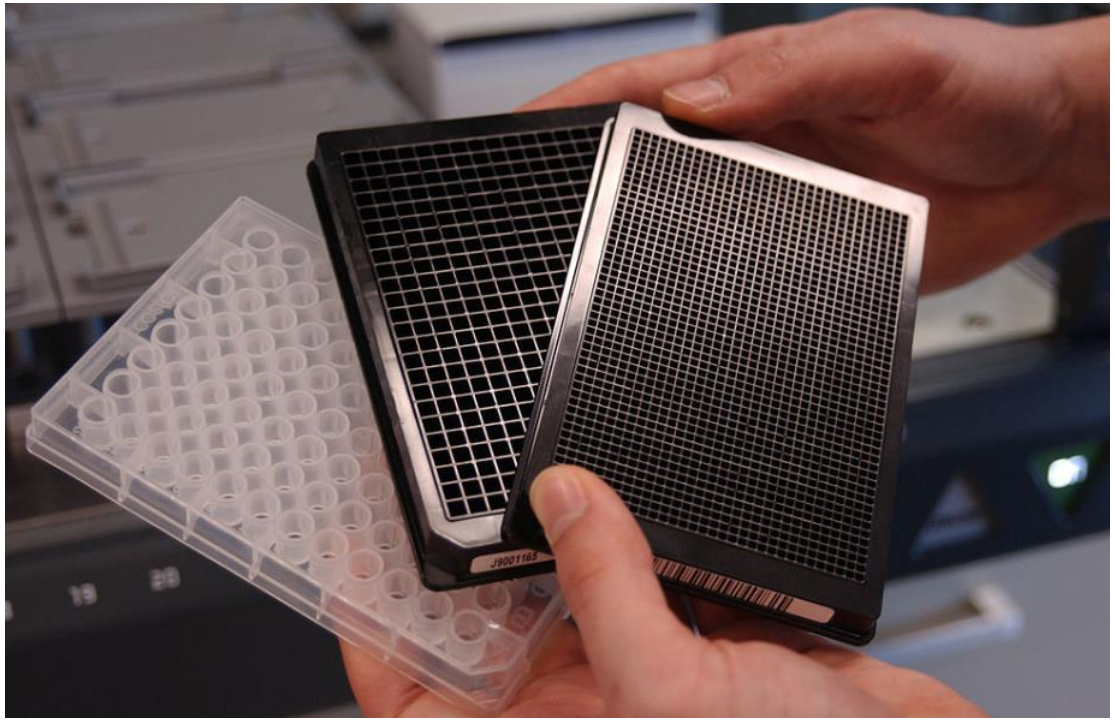
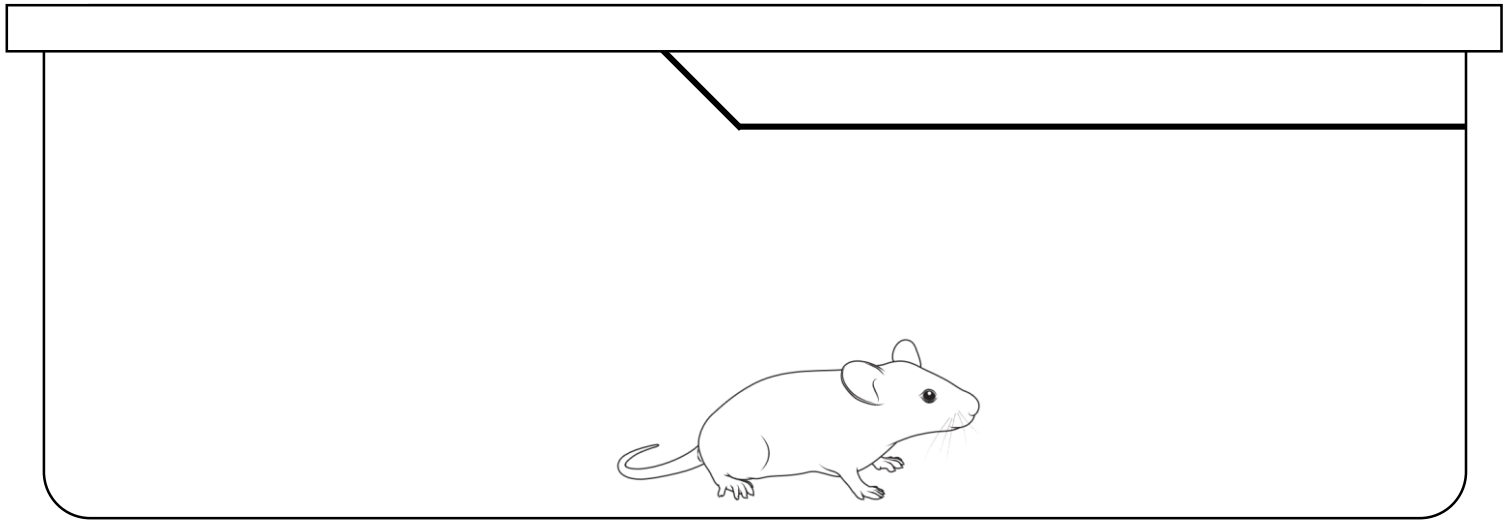


A home-cage vision for behavioral neuroscience



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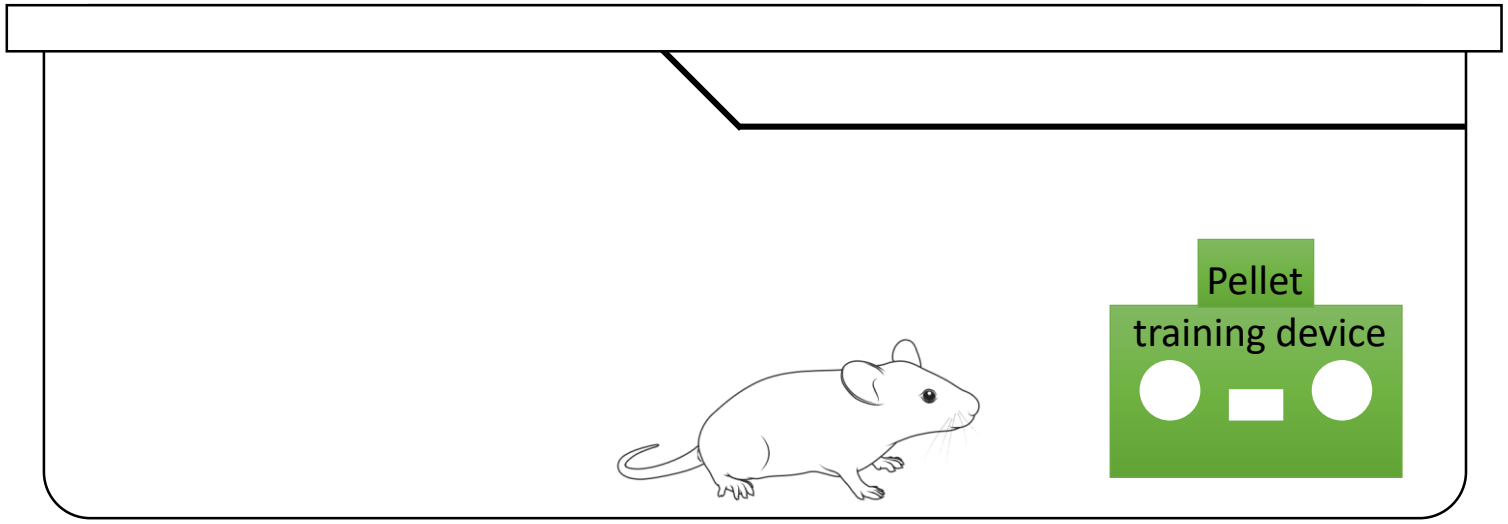

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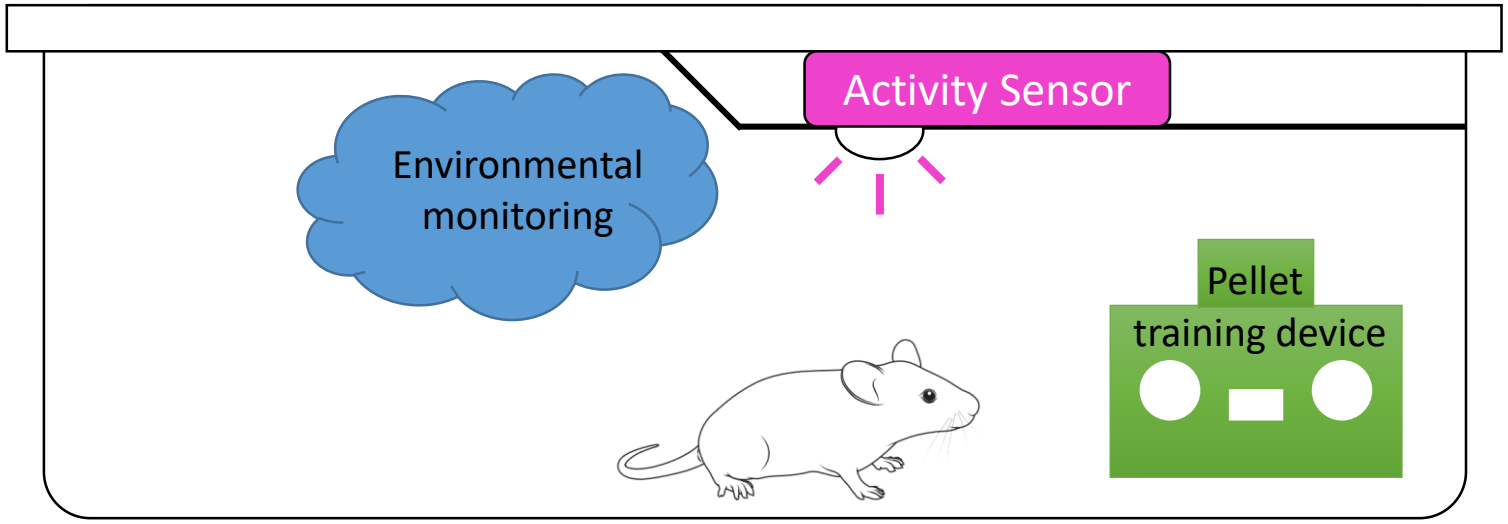

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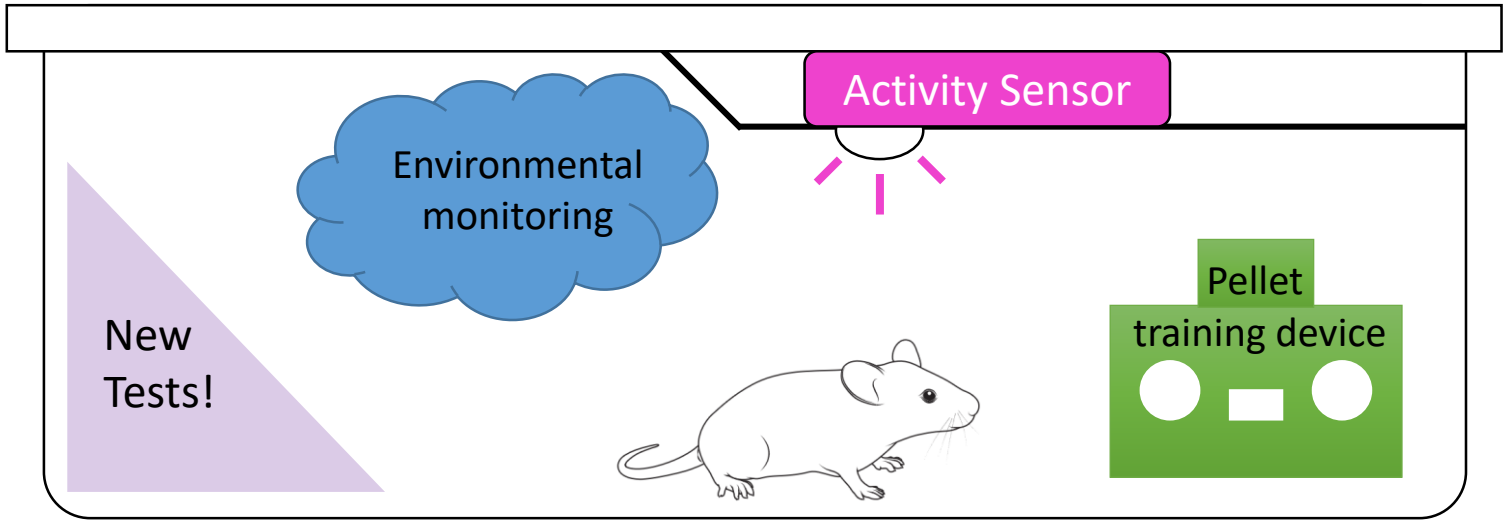

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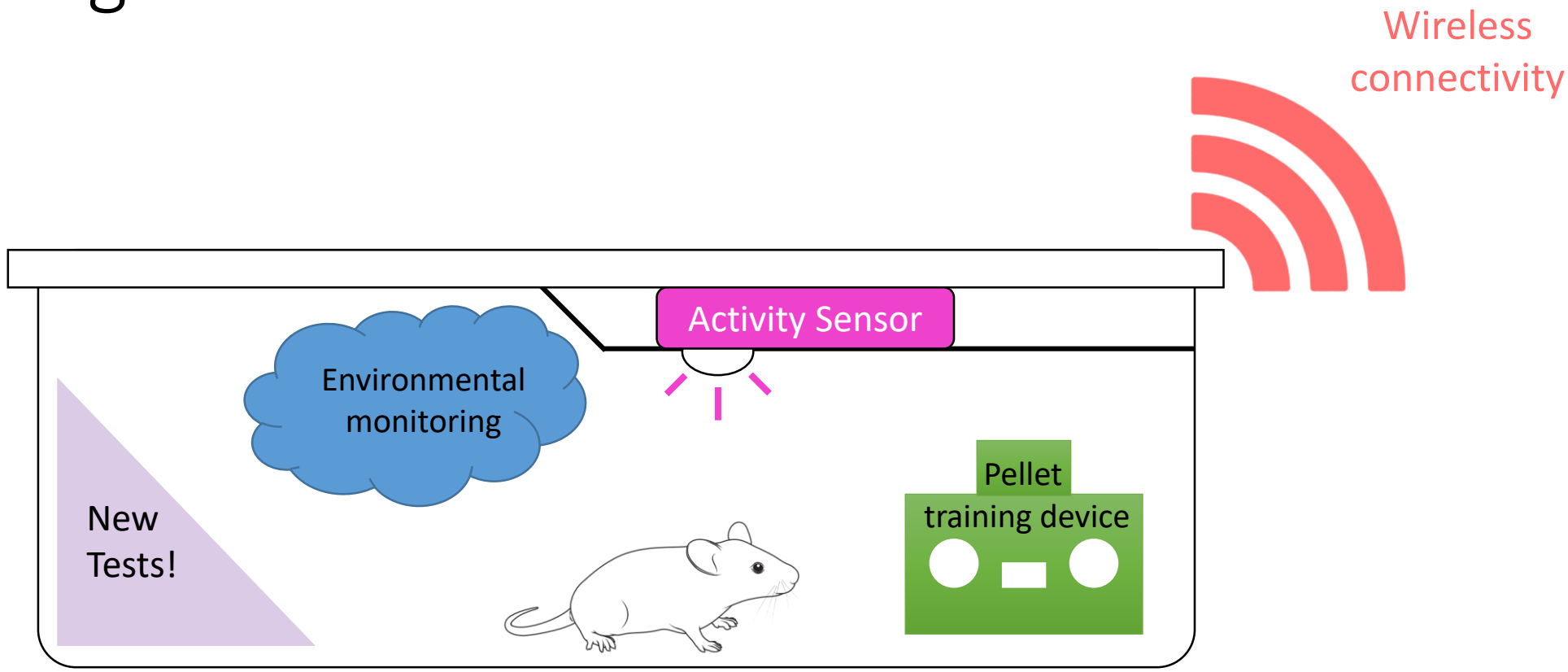
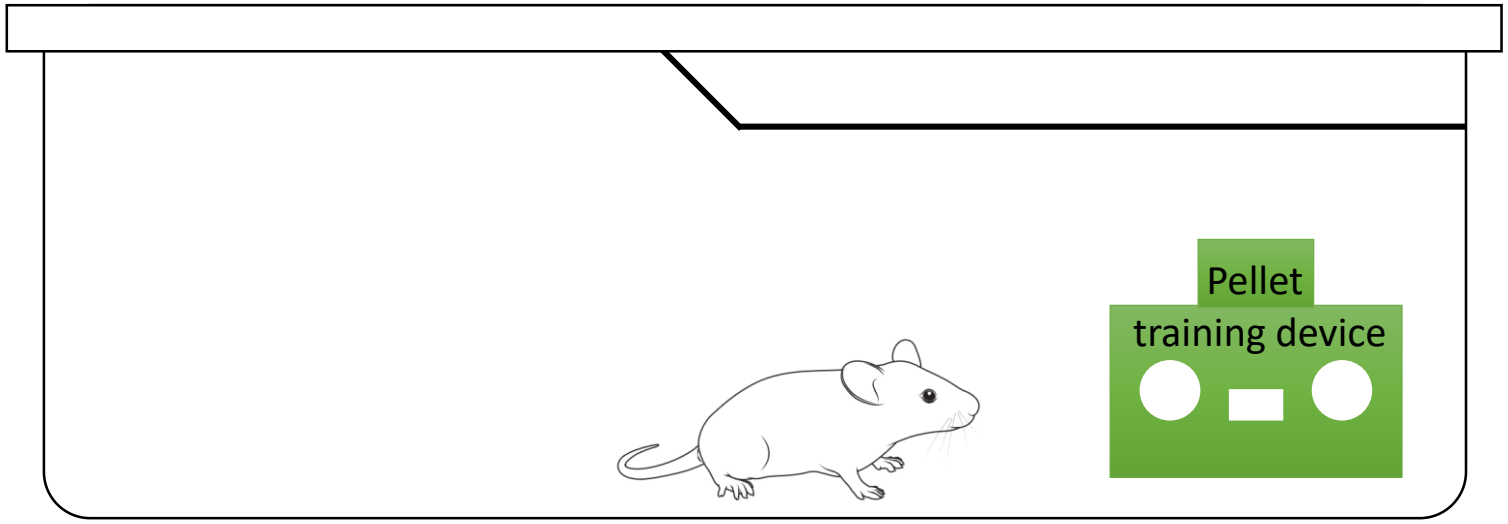
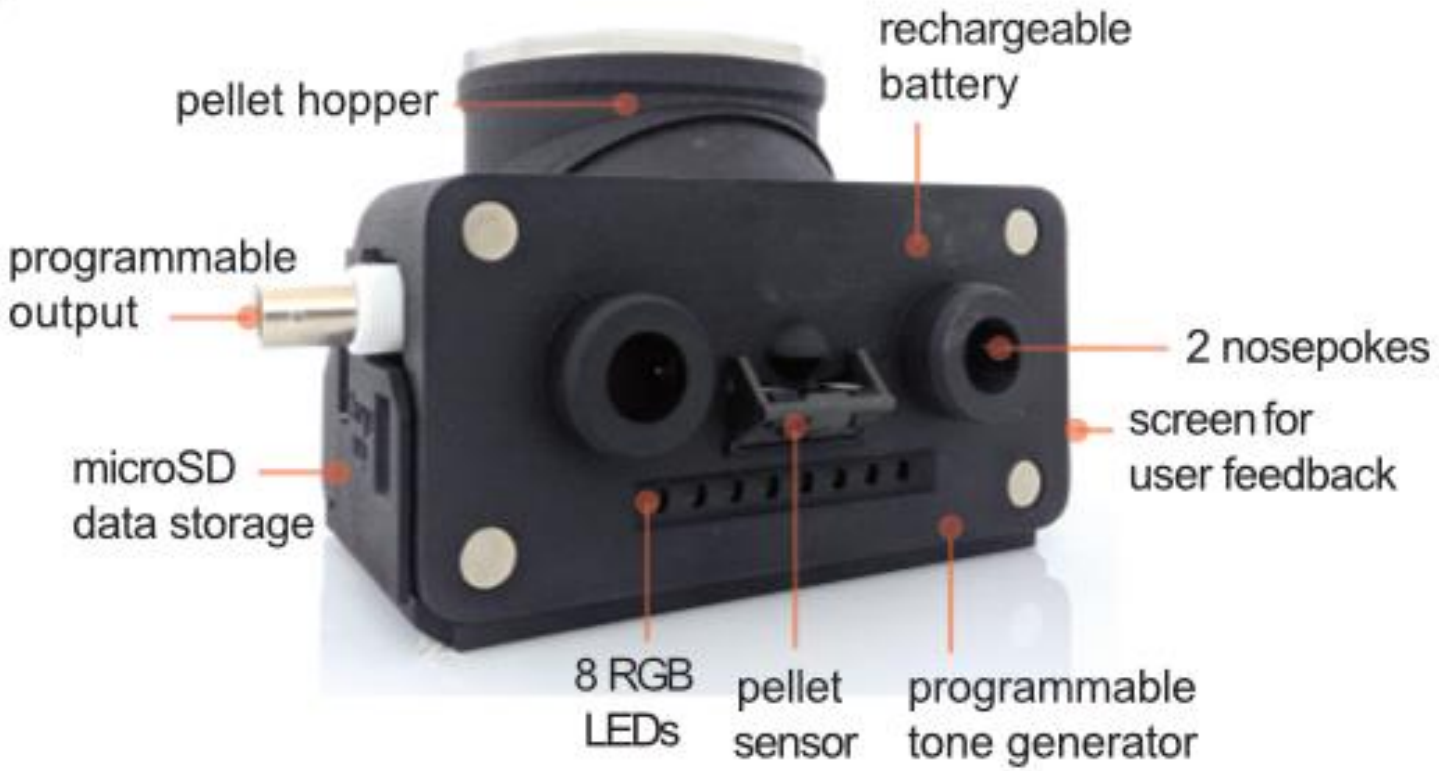


Feeding Experimentation Device version 3 (FED3)



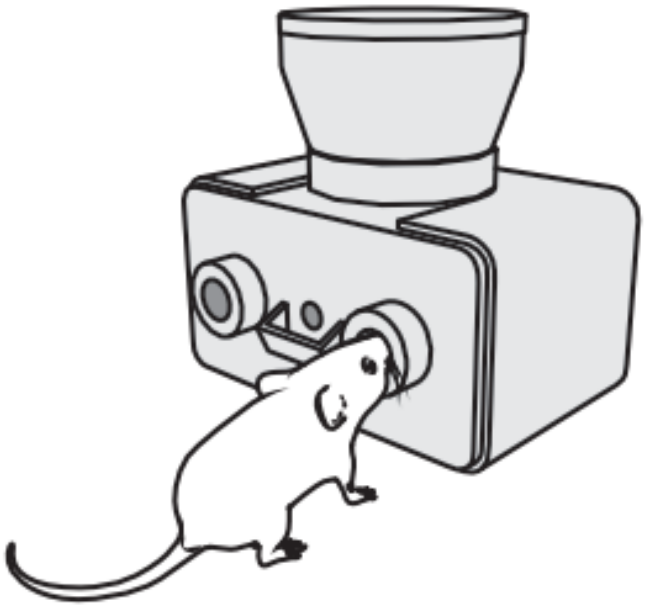
Check out the original FED! Nguyen et al., J Neuroscience Methods, 2016

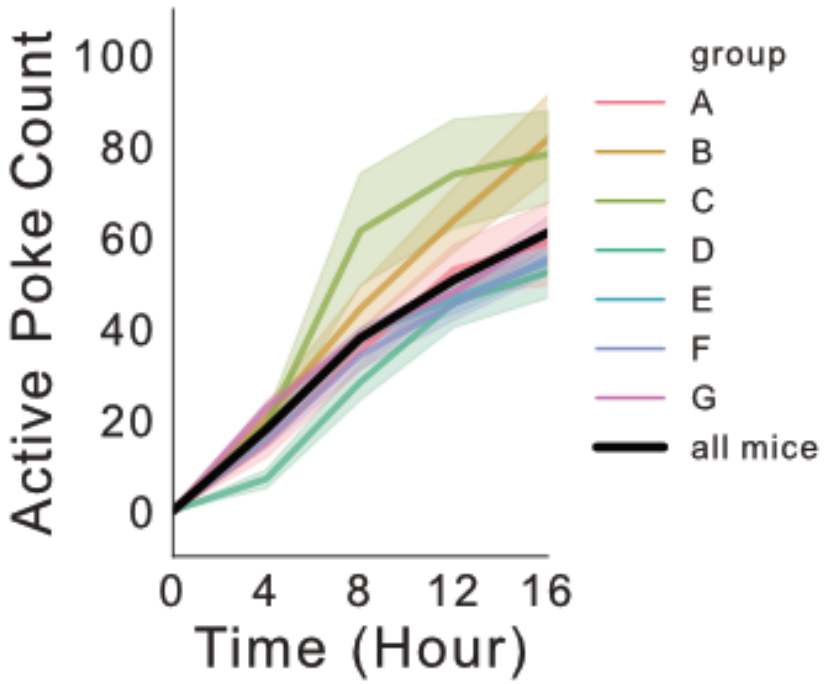
Feeding Experimentation Device version 3

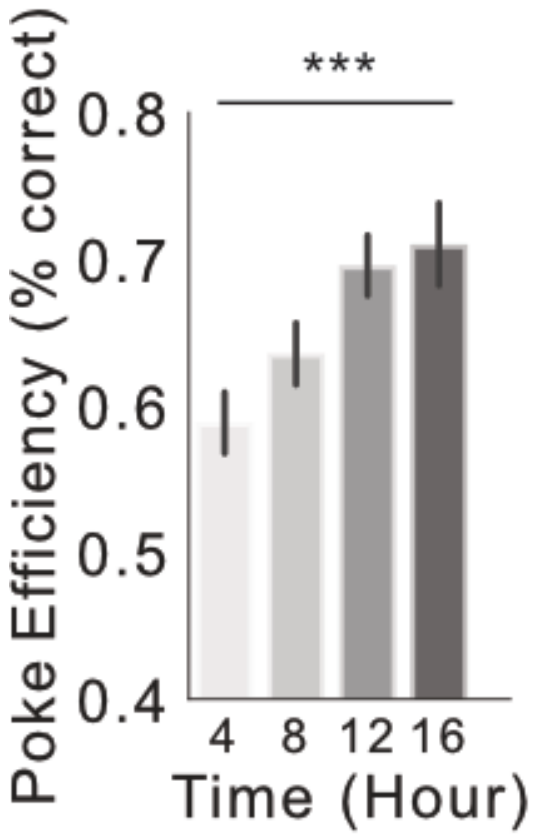


https://github.com/KravitzLabDevices/FED3

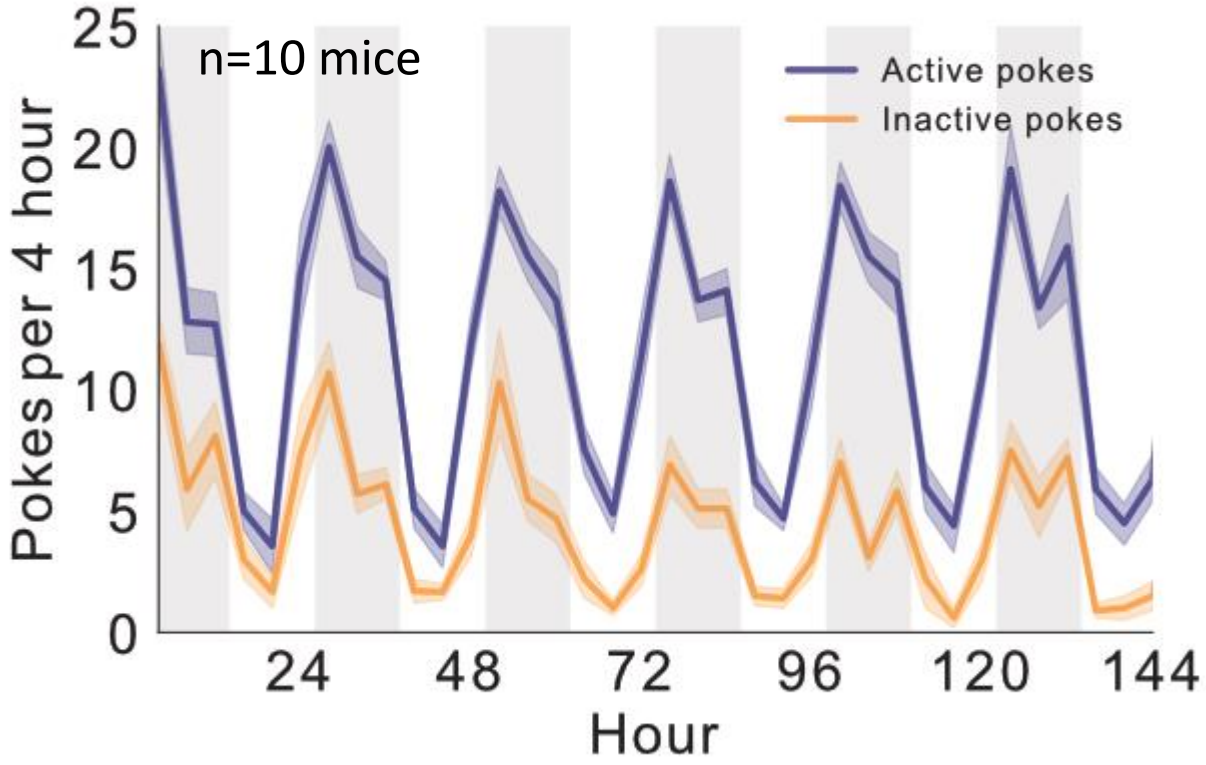
FED3 can automatically train mice in home-cages

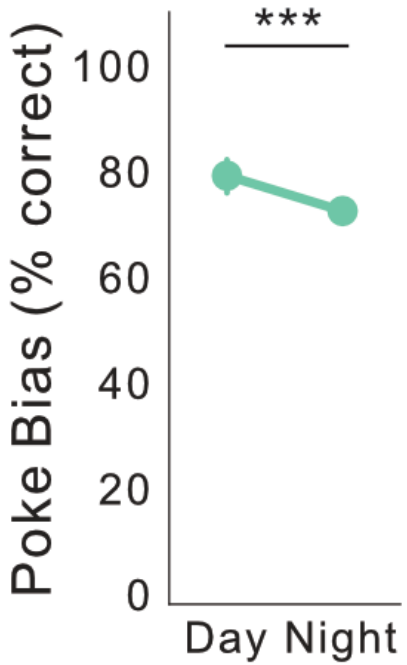




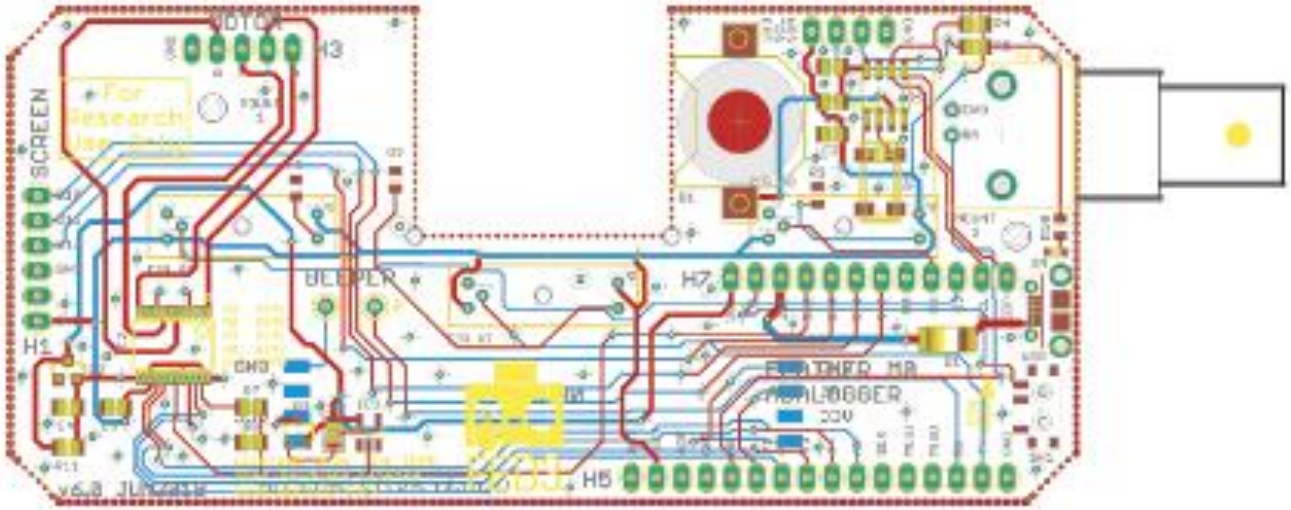


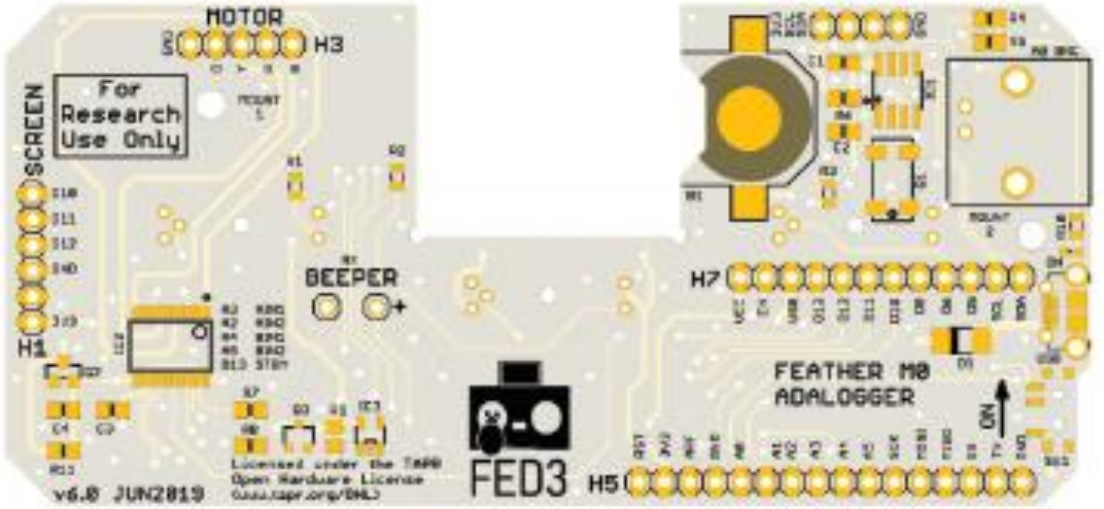
FED3 can be used for long-term home-cage experiments





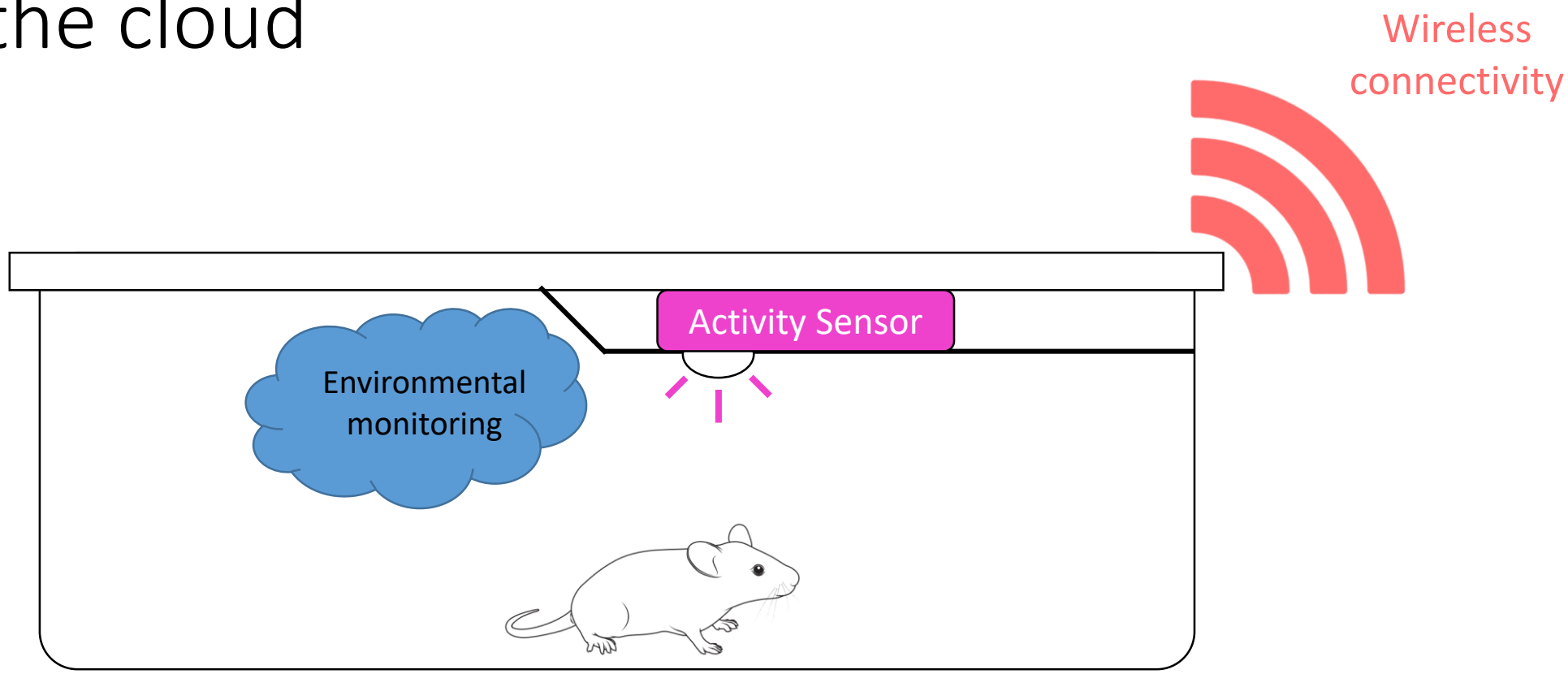
FED3 is open-source





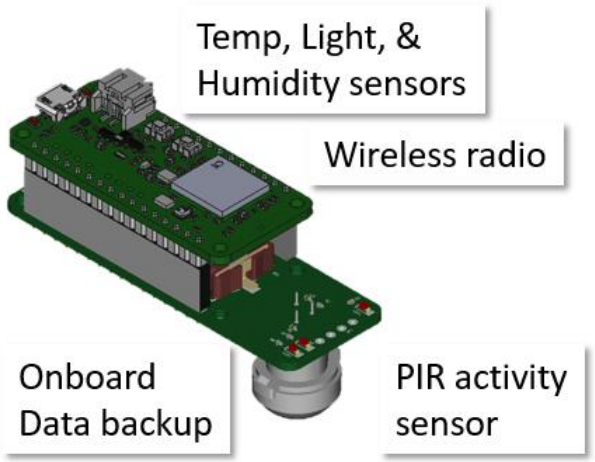
https://github.com/KravitzLabDevices/FED3

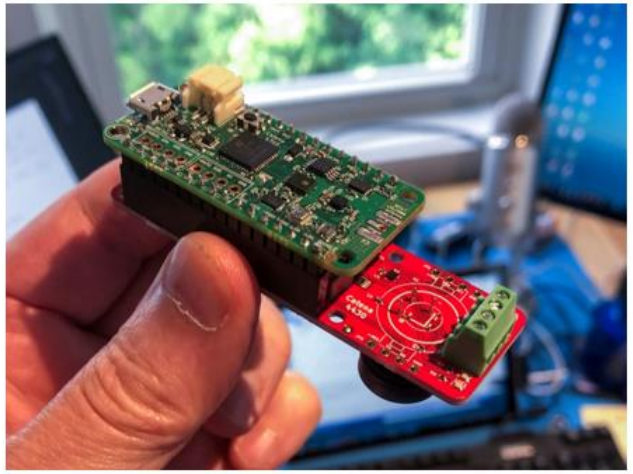
Transmitting activity and in-cage environmental data to the cloud

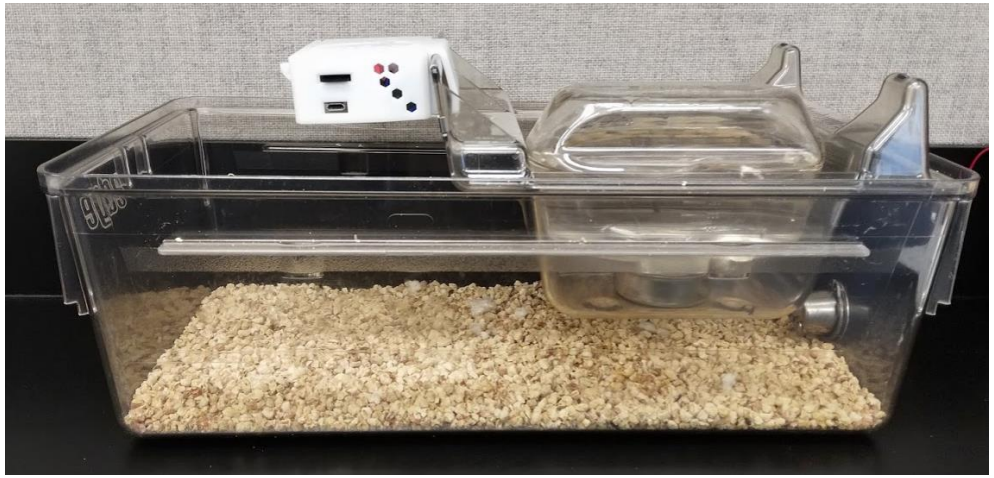


With: https://mcci.com/

We designed an in-cage device that senses environment, activity, and transmits this data wirelessly to the cloud



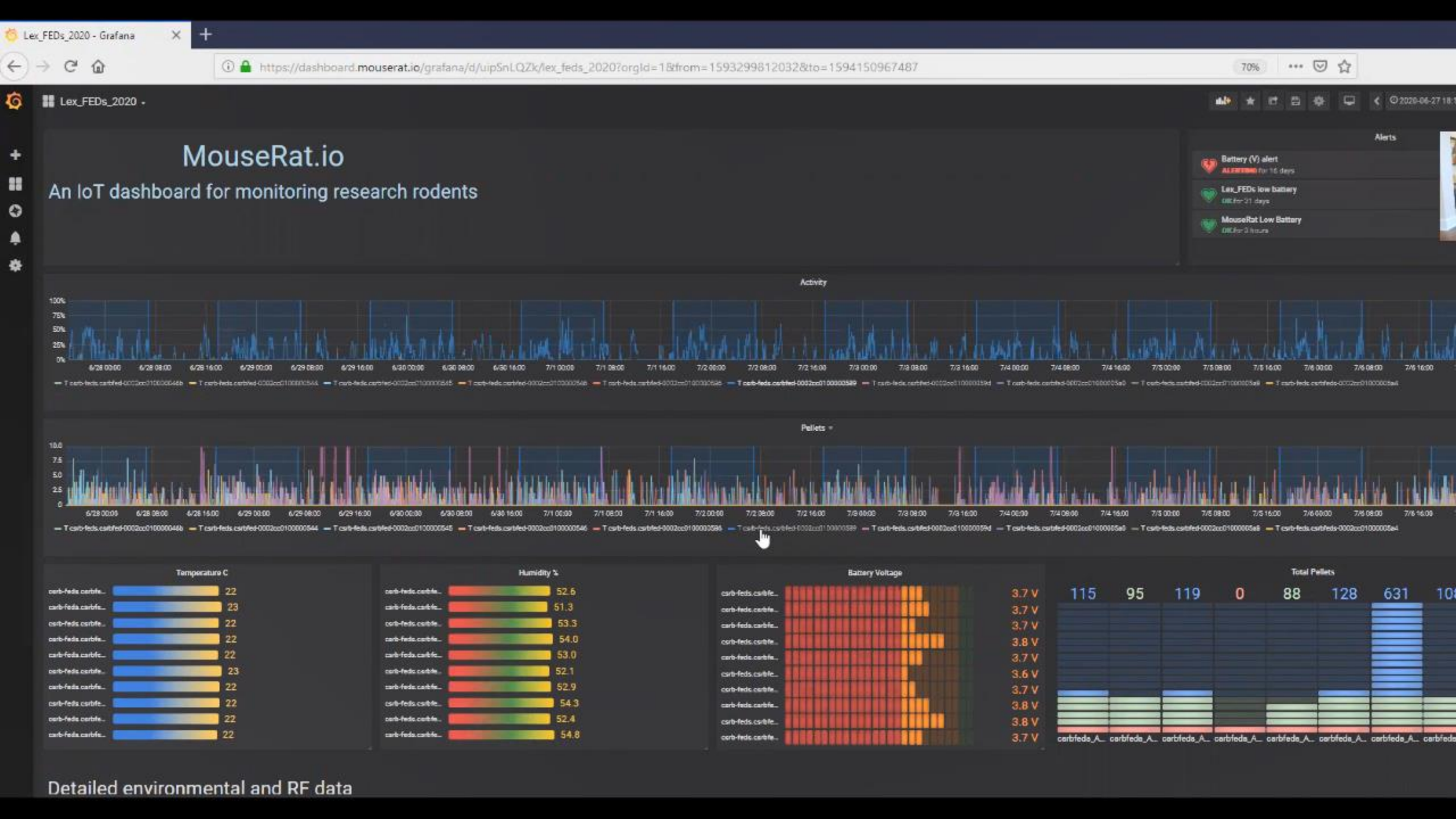




www.mouserat.org

https://github.com/mcci-catena/mcci-catena-4430

mouse rat.io


Lex_FEDs_2020 - Grafana
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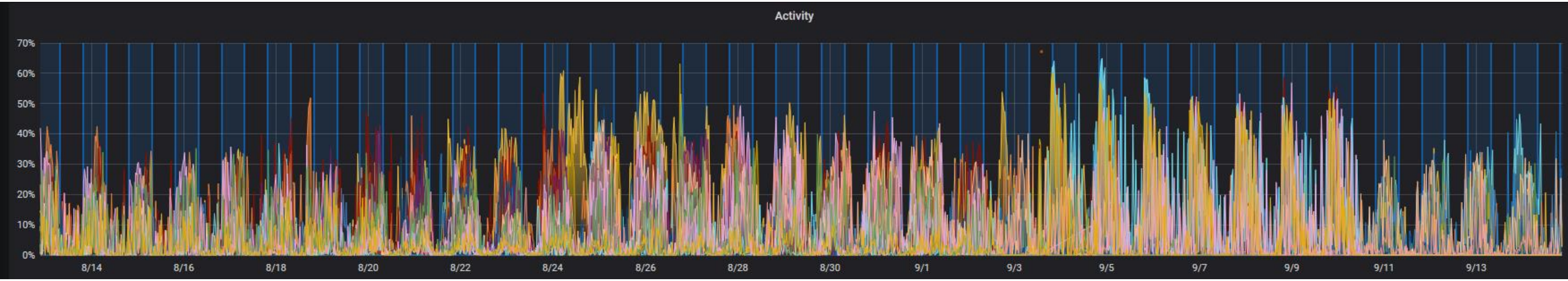
Lex_FEDs_2020
MouseRat.io
An IoT dashboard for monitoring research rodents
Alerts
Battery (V) alert
Lex_FEDs low battery
MouseRat Low Battery
Activity
Pellets
Temperature C
Humidity %
Battery Voltage
Total Pellets
Detailed environmental and RF data

The MouseRat device uses passive infrared (PIR) sensing to detect motion



N=26 mice

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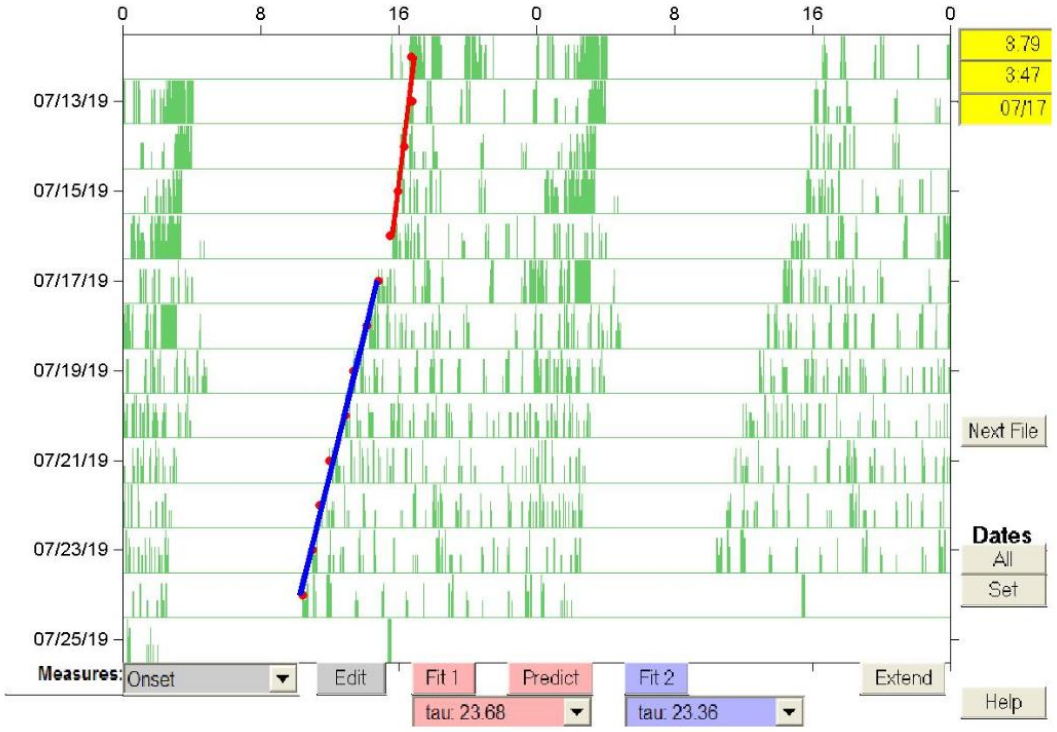
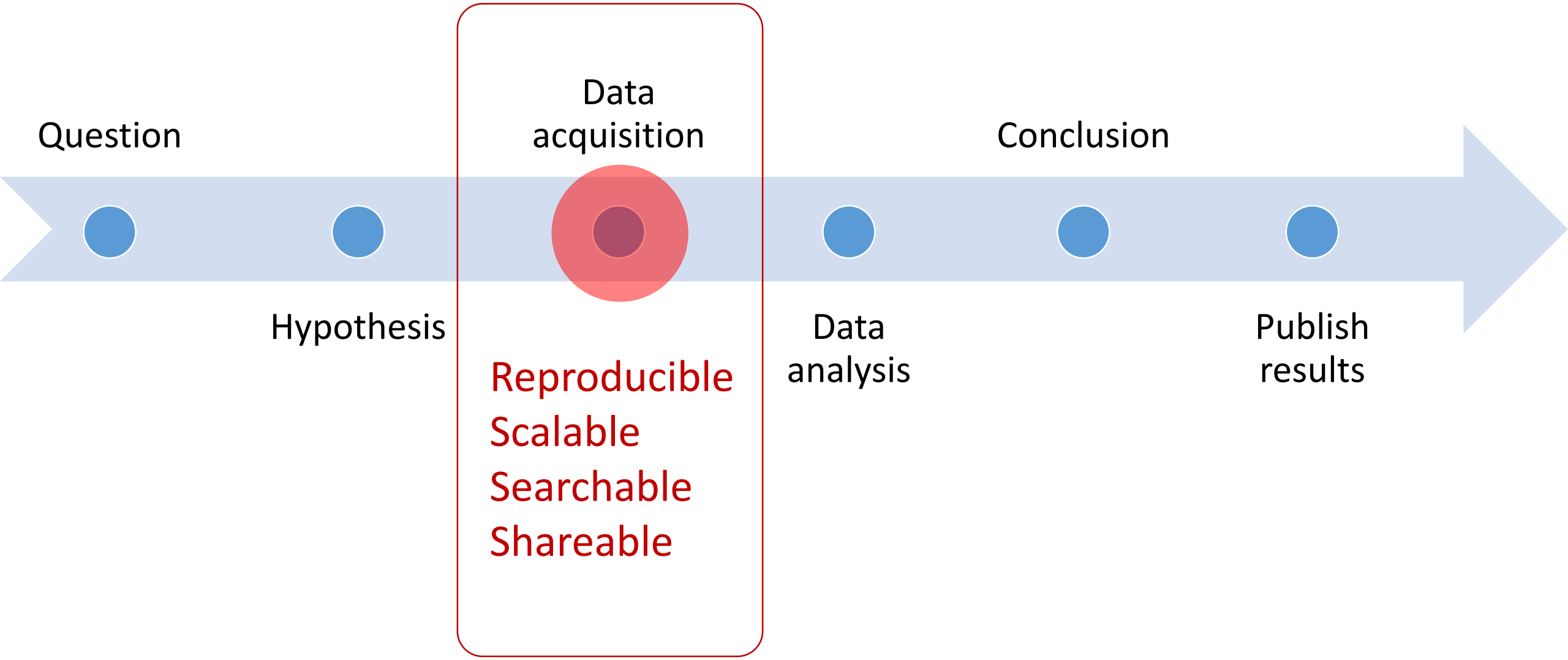


Data and photo courtesy of Clara Hozer and Fabien Pifferi
Centre national de la recherche scientifique (CNRS), Paris, France

The idealized scientific process



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FED3

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MouseRat

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Dinesh Kumar (MCCI)
Yu-Hsuan Chang
Meaghan Creed

Questions?
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